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EXAMINER

BAYARD, EMMANUEL

ART UNIT PAPER NUMBER

2631

DATE MAILED: 01/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/745,301

Applicant(s)

KANNAN ET AL.

Examiner

Emmanuel Bayard

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 September 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This is in response to amendment filed on 9/8/04 in which claims 1-34 are pending. The applicant's amendments have been fully considered but they are moot based on the new ground of rejection.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1-11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. Claim 1 recites the limitation "the received signal" in 5. There is insufficient antecedent basis for this limitation in the claim.

Claims 2-11 are likewise rejected because they depend on a base rejected claim.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 12-15 and 23-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frodigh et al U.S. patent No 5,726,978 in view of Barton et al U.S. patent No 6,654,432 B1.

As per claim 12, Frodigh et al discloses a method for error reduction in a communication system comprising a plurality of orthogonal sub carriers, the method comprising steps of: determining a signal quality metric for each orthogonal sub carrier of the plurality of orthogonal sub carriers to produce a plurality of signal quality metrics (see abstract and col.4, lines 57-67 and col.5, lines 12-25 and col.8, lines 59-63 and col.16, lines 27-45); and suppressing an orthogonal sub carrier of the plurality of orthogonal sub carriers based on a signal quality metric of the plurality of signal quality metrics (see col.2, lines 43-45, 58-60 and col.3, lines 25-27 and col.12, lines 18-50 and col.18, lines 23-29).

However Frodigh does not teach utilizing a guard band interval to ameliorate the intersymbol interference.

Barton et al teaches utilizing a guard band interval to ameliorate the intersymbol interference (see col.4, lines 56-67).

It would have been obvious to one of ordinary skill in the art to implement the teaching of Barton into Frodigh as to reduce maximum achievable rate by a factor of V ($N+V$) as taught by Barton (see col.5, lines 13-18).

As per claim 13, Barton et al includes the step of suppressing an orthogonal sub carrier comprises steps of: determining an order of the plurality of orthogonal sub carriers; and suppressing an orthogonal sub carrier of the plurality of orthogonal sub carriers based on the determined order (see 60-67 and col.11, lines 58-63).

It would have been obvious to one of ordinary skill in the art to implement the teaching of Barton into Frodigh as to reduce maximum achievable rate by a factor of V ($N+V$) as taught by Barton (see col.5, lines 13-18).

As per claim 14, Frodigh et al and Barton in combination would include the step of suppressing an orthogonal sub carrier comprises steps of: comparing at least one signal quality metric of the plurality of signal quality metrics to a signal quality metric threshold to produce a comparison; and suppressing an orthogonal sub carrier of the plurality of orthogonal sub carriers based on the comparison as to perform both channel estimation and symbol timing and carrier frequency offset estimation of different pilots symbols..

As per claim 15, Frodigh et al and Barton in combination would include the communication system further comprises a transmitting communication device that transmits user information and a receiving communication device that receives user information, wherein the step of determining a signal quality metric is performed by the receiving communication device, and wherein the step of suppressing a sub carrier is performed by the transmitting communication device as to accurately perform both channel estimation and symbol timing and carrier frequency offset estimation of different pilots symbols.

1. Claims 23-33 are rejected under 35 U.S.C. 102(e) as being anticipated by Frodigh et al U.S. Patent No 5,726,978.

As per claims 23, 26, 28 Frodigh et al discloses a communication device comprising: a receiver that receives a signal that comprises a plurality of orthogonal sub

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carriers (see figs 3a, 3c element 330 and col.4, lines 30-50 and col.8, lines 38-44); a signal processing unit coupled to the receiver that receives the plurality of orthogonal sub carriers from the receiver (see fig. 3a element 360), determines a signal quality metric for each subcarrier of the plurality of orthogonal sub carriers, and determines subcarrier suppression information based on the determined signal quality metrics (see abstract and col.4, lines 50-67 and col.8, lines 59-63 and col.16, lines 27-30); and a transmitter (see fig.3a element 300) coupled to the signal processing unit that receives the subcarrier suppression information from the signal processing unit and transmits the received subcarrier suppression information.

However Frodigh does not teach removes guard band interval

Barton et al teaches removes a guard band interval (see col.5, lines 23).

It would have been obvious to one of ordinary skill in the art to implement the teaching of Barton into Frodigh as for the maximum achievable rate would have an higher level of attenuation which would lead to different values of SIN as taught by Barton (see col.5, lines 25-30).

As per claim 24, Frodigh does teach the subcarrier suppression information comprises the determined signal quality metrics (see col.8, lines 59-63).

As per claim 25, Frodigh et al and Barton in combination would include a memory associated with the signal processing unit that stores a signal quality metric threshold, wherein the signal processing unit further retrieves the signal quality metric threshold from the memory and compares at least one determined signal quality metric to the signal quality metric threshold to produce a comparison, and wherein the

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subcarrier suppression information comprises the comparison to accurately perform both channel estimation and symbol timing and carrier frequency offset estimation of different pilots symbols.

As per claim 27, Frodigh et al and Barton in combination would include the signal processing unit modulates the data onto each orthogonal subcarrier of the plurality of orthogonal sub carriers prior to suppressing the at least one orthogonal subcarrier to accurately perform both channel estimation and symbol timing and carrier frequency offset estimation of different pilots symbols to accurately perform both channel estimation and symbol timing and carrier frequency offset estimation of different pilots symbols.

As per claim 29, Frodigh et al and Barton in combination would include the determination of an equalization function by the signal processing unit comprises determining a desired composite communication channel transfer function and determining an equalization function based on the communication channel transfer function and the desired composite communication channel transfer function to accurately perform both channel estimation and symbol timing and carrier frequency offset estimation of different pilots symbols.

As per claim 30, Frodigh et al and Barton in combination would include the signal comprising a plurality of orthogonal sub carriers comprises a first signal, wherein the receiver further receives a second signal comprising a plurality of orthogonal sub carriers, wherein the signal processing unit determines subcarrier suppression information based on the plurality of orthogonal sub carriers included in the first signal

and conveys the determined subcarrier suppression information to a transmitter coupled to the signal processing unit, and wherein the transmitter transmits the subcarrier suppression information to accurately perform both channel estimation and symbol timing and carrier frequency offset estimation of different pilots symbols.

As per claim 31, Frodigh et al and Barton in combination would include wherein the communication device further comprises a plurality of antennas, wherein the reception by the receiver of a signal comprises receiving a transmitted signal via each antenna of the plurality of antennas to produce a plurality of received signals, wherein the transmitted signal comprises a plurality of orthogonal sub carriers, wherein a determination of an equalization function by the signal processing unit comprises a determination of a plurality of equalization functions based on a determination of at least one communication channel transfer function, wherein the plurality of equalization functions together reduce a multipath delay of the transmitted signal when the multipath delay exceeds a tolerable multipath delay, and wherein a processing of the signal by the signal processing unit comprises processing each received signal based on a determined equalization function of the plurality of determined equalization functions to accurately perform both channel estimation and symbol timing and carrier frequency offset estimation of different pilots symbols.

As per claim 32, Frodigh et al and Barton in combination would include the determination of a plurality of equalization functions comprises determining a plurality of composite equalization functions, wherein each composite equalization function of the plurality of composite equalization functions comprises a plurality of equalization

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functions that together reduce a multipath delay of the transmitted signal, determining an optimal composite equalization function from among the plurality of composite equalization functions, and determining a plurality of equalization functions based on the determination of an optimal composite equalization function to accurately perform both channel estimation and symbol timing and carrier frequency offset estimation of different pilots symbols.

As per claim 33, Frodigh et al and Barton in combination would include the determination of an optimal composite equalization function comprises determining, for each composite equalization function of the plurality of composite equalization functions, a signal-to-noise ratio (SNR) for at least one subcarrier of a signal received by the communication device to produce determined SNR's, determining, for each composite equalization function of the plurality of composite equalization functions, a minimum SNR from among the determined SNR's, determining a maximum SNR from among the minimum SNR's determined for each composite equalization function of the plurality of composite equalization functions to produce a determined maximum SNR, and determining an optimal composite equalization function based on the composite equalization function corresponding to the determined maximum SNR to accurately perform both channel estimation and symbol timing and carrier frequency offset estimation of different pilots symbols.

Allowable Subject Matter

6. Claim 1 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

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7. Claims 2-11 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

8. Claim 34 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. The following is a statement of reasons for the indication of allowable subject matter: the prior art of record fail to anticipate or render obvious the following recited features: suppressing, by the second communication device, an orthogonal sub carrier of the plurality of orthogonal sub carriers based on the received sub carrier suppression information to produce a suppressed sub carrier and a non-suppressed sub carrier as recited in claims 1 and 34.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kim et al U.S. patent No 6,172,993 B1 teaches a frame synchronization and apparatus.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Emmanuel Bayard whose telephone number is 571 272 3016. The examiner can normally be reached on Monday-Friday (7:Am-4:30PM)

Alternate Friday off.

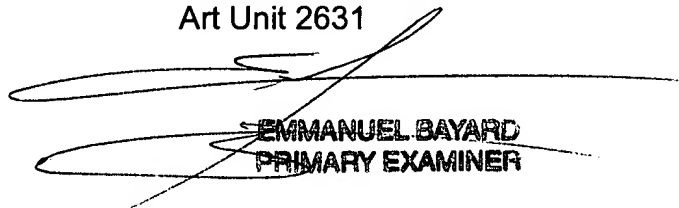
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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammed Ghayour can be reached on 571 272 3021. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Emmanuel Bayard
Primary Examiner
Art Unit 2631

1/5/05



EMMANUEL BAYARD
PRIMARY EXAMINER